

## *Raillietina (Raillietina) alectori* sp. n. and other avian Cestodes from Israel and Sinai

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**Abstract.** — Ninety-seven tapeworm samples were recovered from sixty-one species of birds from Israel and Sinai. Sixty-one were identified. Another thirty-six were identified to genus only. Seven of these require further study and will be reported on later. All species are new locality records, and sixteen are new host records. *Raillietina (R.) alectori* sp. n. is most similar to *R. (R.) graeca* Davies and Evans, 1938, but differs from it in the location of the genital atrium (equatorial in *R. graeca*, pre-equatorial in *R. alectori*), and by distribution of testes (extending past osmoregulatory canals in *R. graeca*, confined between the canals in *R. alectori*).

**Résumé.** — Quatre-vingt-dix-sept échantillons différents de Cestodes ont été récoltés chez soixante et une espèces d'Oiseaux d'Israël et du Sinai. Soixante et un ont été identifiés jusqu'au niveau spécifique et trente-six jusqu'au niveau générique seulement. Parmi ces derniers, sept nécessitent une étude plus poussée et seront décrits ultérieurement. Toutes ces espèces proviennent de localités nouvelles et seize d'entre elles ont été récoltées chez des hôtes nouveaux. *Raillietina (R.) alectori* n. sp. est très proche de *R. (R.) graeca* Davies et Evans, 1938, mais en diffère par la position de l'atrium génital (équatorial chez *R. graeca* et pré-équatorial chez *R. alectori*) et par la localisation des testicules (s'étendant au-delà des canaux osmo-régulateurs chez *R. graeca*, et situés entre les canaux chez *R. alectori*).

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### INTRODUCTION

The collection of helminth parasites in Israel was initiated by G. WITENBERG, with the establishment of the Department of Parasitology, the Hebrew University of Jerusalem, in the late 1920's. During the years 1956-1962 a survey of parasites of wild birds and mammals was conducted with the aid of Grant E-1315 from National Institutes of Health, USA. Data on collection sites and animals examined during this survey were published by THEODOR and COSTA (1967) in their report on ectoparasites. The helminth collection was further enlarged in the years 1969-1970 when a changing political situation enabled examination of birds and mammals from the Sinai Peninsula. Several papers on nematodes and Acantho-

cephala recovered in the survey are in print (QUENTIN and WERTHEIM, 1975 ; SCHMIDT, 1975 ; WERTHEIM and DURETTE-DESSET, 1975 ; WERTHEIM and GREENBERG, 1970).

The present report deals with avian cestodes. Other cestodes from birds and mammals will be described later. Classification follows SCHMIDT (1986).

#### MATERIAL AND METHODS

Birds were shot, the intestines removed, split longitudinally and placed in water for relaxation of the tapeworms. Samples collected by WITENBERG (marked C— in table 1) were fixed in warm 70 % alcohol, stained in alun carmine, cleared in xylol and mounted in Canada balsam. Cestodes collected in more recent surveys were fixed in AFA, cleared in clove oil and mounted in Permount. Many of these slides had to be dissolved off and remounted in balsam. Drawings were made with the aid of a camera lucida.

#### RESULTS

Ninety-seven tapeworm samples were recovered from sixty-one species of birds from Israel and Sinai. Sixty-one species were identified. Another thirty-six were identified to genus only (table 1). Seven samples require further study as they may represent new species. All findings are new locality records and sixteen are new host records.

#### **Raillietina (Raillietina) alectori sp. n.**

(Fig. 1, A-E)

Numerous specimens were collected from the small intestines of five partridges, *Alectoris graeca* (Aves, Galliformes, Phasianidae), out of thirty-three examined. The following description is based on ten worms in excellent condition. Measurements are in micrometers unless otherwise stated.

#### DESCRIPTION

Strobila 10-12 cm long, 1-3 mm greatest width at level of developing uterus. Scolex (fig. 1A) rounded, 200-220 long, 190-250 greatest width. Suckers rounded, 60-75 by 55-71, armed with two circles of hooks 8-9 long. Rostellum 55-82 wide, armed with two circles of 100-140 hooks, each 10-15 long. Neck 1.1-1.3 mm long.

Proglottids craspedote. Genital pores unilateral, pre-equatorial. Genital ducts (fig. 1B) pass between osmoregulatory canals. Genital atrium simple, 8-12 deep, 28-35 wide. Ventral osmoregulatory canals with simple anastomosis near posterior end of each proglottid ; ventral canals 8-12, dorsal about 4 wide in mature segments. Reproductive systems (fig. 1C) protandrous.

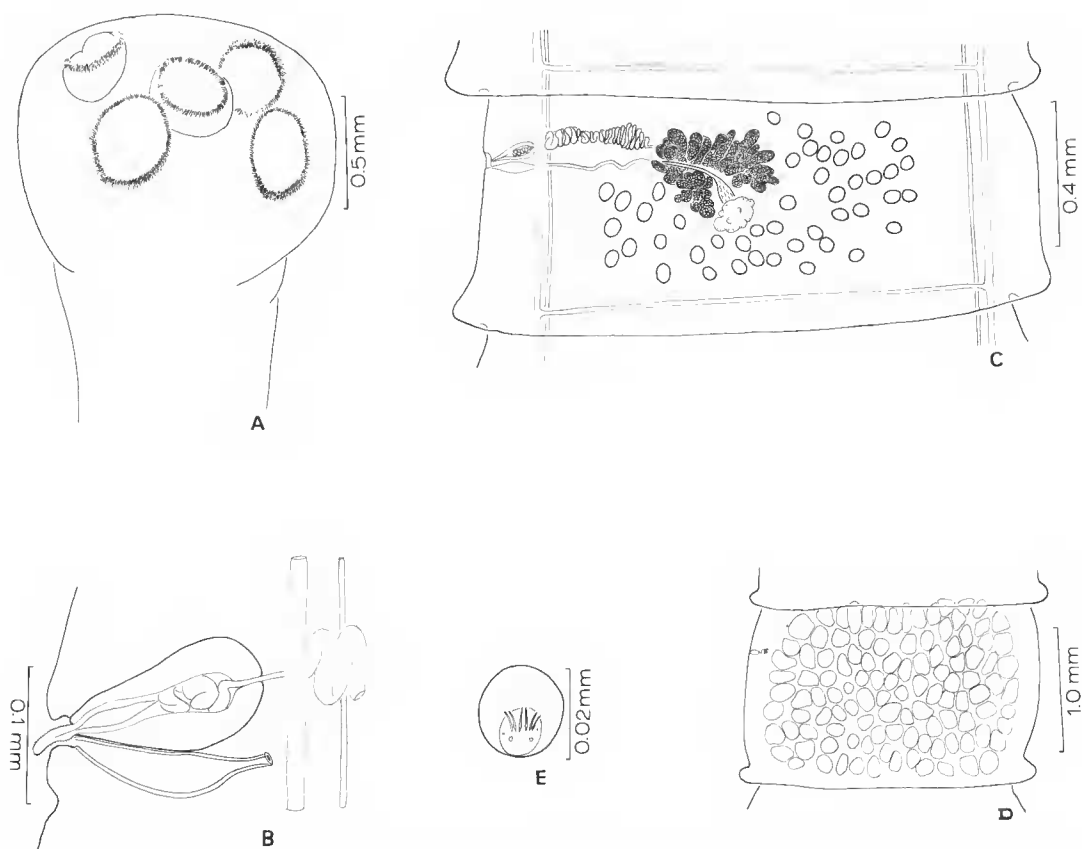


FIG. 1. — *Raillietina (R.) alectori* sp. n. from *Alectoris graeca* in Israel : A, scolex ; B, terminal genital ducts ; C, mature proglottid ; D, gravid proglottid, showing egg capsules ; E, egg.

*Male genitalia* : 41-70 testes, each 40-60 wide in mature segments. Vas deferens coiled in anterior, poral field. Ejaculatory duct coiled inside cirrus pouch. Cirrus pouch pear-shaped, 110-170 long, 50-60 wide with very thick walls, not reaching ventral osmoregulatory canals. Cirrus slender, armed with very tiny spines.

*Female genitalia* : Ovary slightly poral, lobulated, 200-320 long, 240-360 wide. Vitellarium slightly lobated, posteromedial to ovary, 80-90 long, 110-160 wide. Vagina posterior to cirrus pouch, muscular and expanded at its distal end. Egg capsules 70-100 per gravid proglottid (fig. 1D) each 120-215 wide, containing 7-15 eggs each. Eggs (fig. 1E) round, 25-35 wide, with thin shells. Onchosphere round, 20-32 wide. Hooks about 10 long.

TYPE HOST : Partridge, *Alectoris graeca* (Meisner) ; other host, *Francolinus francolinus* L.

TYPE LOCALITY : Sattaf, Israel.

HABITAT : Small intestine.

TYPE SPECIMENS : MNHN (Muséum national d'Histoire naturelle, Paris) : holotype no. 229CVII, paratypes no. 230CVII.

ETYMOLOGY : Named for the genus of host.

#### DISCUSSION

Among the subgenus *Raillietina* from birds of the order Galliformes, *R. alectori* most closely resembles *R. graeca* Davies and Evans, 1938, which is found in the same host in India and in the USSR. That species has 35 to 40 testes, 100 hooks 13 long, and a cirrus pouch 128 long, compared with 41-70 testes, 100-140 hooks 10-15 long, and a cirrus pouch 110-170 long in *R. alectori*. However, the two species are easily differentiated by the location of the genital atrium (equatorial in *R. graeca*, preequatorial in *R. alectori*), and by distribution of testes (extending past osmoregulatory canals in *R. graeca*, confined between the canals in *R. alectori*). Other species of *Raillietina* from birds of the order Galliformes are listed in ARTYUKH's monograph (1966).

Among species from birds of other orders, *R. alectori* is closest to *R. joyeuxi* (López-Neyra, 1929) from *Columba livia* in Spain. That species has hooks 12-25 long, compared with 10-15 long in *R. alectori*, and a cirrus pouch 200-220 long compared with 110-170 in the present species. Further, the genital atrium of *R. joyeuxi* is equatorial.

#### Acknowledgements

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TABLE 1. — Cestodes from birds of Israel and Sinai.

HOST	CESTODE	LOCALITY	* HUJP voucher no.
<i>Alauda arvensis</i> Bonap., 1841	<i>Anonchotaenia globata</i> (Linstow, 1879)	Mishmar Ha Emeq	648
<i>Alectoris graeca</i> (Meisner, 1804)	<i>Davainea proglottina</i> (Davaine, 1860)	Aminadav, Netiv Ha Lamed He	873A
	<i>Echinolepis carioca</i> (Magalhães, 1898)	Bet Guvrin	C-697
	<i>Raillietina</i> ( <i>R.</i> ) <i>graeca</i> Davies et Evans, 1938	Kefar Massaryk	872
	<i>Raillietina</i> ( <i>R.</i> ) <i>alectori</i> sp. n.	Sattaf	2217
	** <i>Variolepis farciminosa</i> (Goeze, 1782)	Bet Guvrin	C-697A
<i>Anas acuta</i> L., 1758	<i>Tetrathyridium</i> sp.	Be'er Sheva	—
	<i>Diorchis</i> sp.	Jericho	—
	<i>Sobolevicanthus gracilis</i> (Zeder, 1803)	Kefar Massaryk	862
	<i>Sobolevicanthus</i> sp.	Kefar Massaryk	—

TABLE 1 (suite).

HOST	CESTODE	LOCALITY	* HUJP voucher no.
<i>Anas clypeata</i> L., 1758	<i>Cloacotaenia megalops</i> (Nitsch in Creplin, 1892)	Jericho	
	<i>Microsomacanthus spiralicirrata</i> Maksimova, 1963	Jericho	
	<i>Schillerius spasskajae</i> (Spasskii, 1963) comb. n.	Jericho	C-82
<i>Anas crecca</i> L., 1758	<i>Diorchis</i> sp.	Bet Sha'an	957
	<i>Sobolevicanthus krabella</i> (Hughes, 1940)	Mishmar Ha'Emeq	920
<i>Anas platyrhynchos</i> L., 1758 Anatidae sp.	<i>Diorchis</i> sp.	Bet Alfa	953
	<i>Cloacotaenia megalops</i>	Jericho	C-62
	<i>Diorchis</i> sp.	Jericho	C-62A
	<i>Echinocotyle</i> sp. (juvenile)	Jericho	
<i>Apus melba tyneti</i> Tschusi, 1904	<i>Sureshia</i> sp.	Wadi Kelt	C-691
<i>Aythya ferina</i> L., 1758	<i>Schillerius ransomi</i> (Schultz, 1940) comb. n.	Ma'agan Mikha'el	1295
<i>Aythya fuligula</i> L., 1758	<i>Fimbriaria fasciolaris</i> (Pallas, 1781) ** <i>Schillerius ransomi</i>	Ein Harod	1254
<i>Buteo buteo</i> L., 1758	** <i>Idiogenes flagellum</i> (Goeze, 1782)	Tel-Aviv	CP-6
<i>Burhinus oedicephalus</i> L., 1758	<i>Choanotaenia coronata</i> (Creplin, 1829)	Atlith, Be'er Sheva, Rehovot, Jerusalem	C-96
	<i>Liga facilis</i> (Meggitt, 1927)	Jerusalem	C-430
	<i>Trichocephaloides megalcephala</i> (Krabbe, 1869)	Kefar Massaryk	462
<i>Calidris alpina</i> L., 1758			
<i>Calidris minuta</i> Leisler, 1812	** <i>Amoebotaenia pekinensis</i> Tsen-Shen, 1932	Atlith	455
	<i>Echinocotyle nitida</i> (Clerc, 1902)	Kefar Massaryk	486A
	** <i>Gyrocoelia crassa</i> Fuhrmann, 1900	Akko	455B
	<i>Kowalewskiella cingulifera</i> (Krabbe, 1869)	Kefar Massaryk	486
<i>Charadrius dubius</i> Gmelin, 1789	** <i>Paraprogynotaenia jimenezii</i> Rysavy, 1966	Atlith	1115
<i>Charadrius</i> sp.	*** <i>Choanotaenia</i> sp.	Huleh	C-646
<i>Ciconia ciconia</i> L., 1758	<i>Anomotaenia discoidea</i> (Beneden, 1868)	Jerusalem	
	<i>Oshmarinolepis microcephala</i> (Rudolphi, 1819)	Jerusalem	C-694
<i>Columba livia</i> Gmelin, 1790	<i>Cotugnia polyacantha</i> Fuhrmann, 1909	Nir David, Ein Harod, Jericho	604
	<i>Killigrewia delafondi</i> (Railliet, 1892)	Be'er Sheva, Jerusalem	1146
	<i>Raillietina</i> (R.) <i>tunetensis</i> Joyeux et Houdemer, 1828	Be'er Sheva, Mishmar-Ha-Negev	1148
	<i>Raillietina</i> (R.) <i>weissi</i> (Joyeux, 1923)	Be'er Sheva, Jerusalem	1147
	<i>Retinometra serrata</i> (Fuhrmann, 1906)	Bet Guvrin, Jerusalem	787
	<i>Sobolevicanthus columbae</i> (Zeder, 1800)	Be'er Sheva, Bet Guvrin, Ein Harod, Jerusalem, Be'er Ora	1145

TABLE I (suite).

HOST	CESTODE	LOCALITY	* HUJP voucher no.
<i>Corvus corax ruficollis</i> Lesson, 1831	<i>Passerilepis stylosa</i> (Rudolphi, 1809)	Mizpe Ramon, † Bir Gafgafa, † Abu Ru- deis	S439
	<i>Raillietina (P.) reynoldsiae</i> (Meggitt, 1926)	Dead Sea	C-752
<i>Corvus corax laurencei</i> Hume, 1873	** <i>Raillietina (P.) reynoldsiae</i>	Jerusalem	C-711
<i>Corvus monedula soemmeringi</i> Fischer, 1811	<i>Passerilepis stylosa</i>	Ness-Ziyona, Bet Gu- vrin	691
	<i>Sobolevicanthus</i> sp.	Ness-Ziyona	690
<i>Corvus rhipidurus</i> Hartert, 1918	<i>Raillietina (P.) reynoldsiae</i>	Dead Sea	
<i>Coturnix coturnix</i> L., 1758	<i>Rhabdometra</i> sp.	Jerusalem	C-704
<i>Cursorius cursor</i> Latham, 1787	<i>Anomotaenia nymphaea</i> (Schrank, 1790)	Mishmar Ha Negev, Bi'ka	1122
	** <i>Raillietina (R.) weissii</i>	Mishmar Ha Negev	1161
	*** <i>Raillietina</i> sp.	Mishmar Ha Negev	1121
<i>Egretta gularis</i> Bosc, 1792	*** <i>Ophiovalipora</i> sp.	† Nabq	S106
<i>Falco naumanni</i> Fleischer, 1818	** <i>Anomotaenia dubia</i> Meggitt, 1927	Rehovoth	C-63
	** <i>Anomotaenia mollis</i> (Volz, 1900)	Maa'baroth	686
<i>Francolinus francolinus</i> L., 1758	** <i>Raillietina (R.) tetragona</i> (Molin, 1858)	Ma'oz	1071
	<i>Raillietina (R.) alectori</i> sp. n.	Ma'oz	1086
<i>Fulica atra</i> L., 1758	<i>Diorchis brevis</i> Rybicka, 1957	Atlith, Huleh, Genos- sar, Yessod Ha Ma'le	933
	<i>Diorchis inflata</i> (Rudolphi, 1819)	Atlith, Genossar, Yes- sod Ha Ma'ale	523
	<i>Diorchis</i> sp.	Kishon	918
	<i>Schillerius ransoni</i> (Schultz, 1940) comb. n.	Atlith, Ma'agan Mi- kha'el	522
<i>Gallinago gallinago</i> (L., 1758)	<i>Aploparaksis crassirostris</i> (Krabbe, 1869)	Bet Alfa	1001
	<i>Echinocotyle</i> sp.	Bet Alfa	1000
<i>Gelochelidon nilotica</i> (Gmelin, 1789)	<i>Tetrabothrius</i> sp.	Jaffa	C-73
<i>Glareola pratincola</i> L., 1766	<i>Anomotaenia nymphaea</i>	Kefar Massaryk	1116
	<i>Aploparaksis brachyphallus</i> (Krabbe, 1869)	Kefar Massaryk	1103
<i>Halcyon smyrnensis</i> L., 1758	<i>Tetrathyridium</i> sp.	Bet Sha'an	—
<i>Himantopus himantopus</i> L., 1758	<i>Acoleus vaginatus</i> (Rudolphi, 1819)	Bet Sha'an, Jericho, Kefar Massaryk	470
	<i>Dicranotaenia tsengi</i> (Joyeux et Baer, 1940)	Kefar Massaryk	830
	<i>Diplophallus polymorphus</i> (Rudolphi, 1819)	Kefar Massaryk	832
	<i>Echinatrium</i> sp.	Kefar Massaryk	479
	<i>Sobolevicanthus</i> sp.	Kefar Massaryk	480

TABLE 1 (suite).

HOST	CESTODE	LOCALITY	* HUJP voucher no.
<i>Hirundo rustica</i> L., 1758	<i>Angularella hirundina</i> (Fuhrmann, 1907)	† Sinai	S448
<i>Hoplopterus spinosus</i> L., 1758	<i>Amoebotaenia brevicollis</i> Fuhrmann, 1907	Ein Harod, Kefar Mas-saryk	901
	<i>Echinocotyle</i> sp. (juvenile)	Kefar Massaryk	476
<i>Larus argentatus</i> Pontopp., 1763	<i>Choanotaenia porosa</i> (Rudolphi, 1810)	Akko	2229A
	<i>Tetrabothrius cylindraceus</i> (Rudolphi, 1819)	Akko	2229
	<i>Tetrabothrius erostris</i> (Loennberg, 1889)	Akko	2227
<i>Larus fuscus</i> L., 1758	<i>Choanotaenia porosa</i>	Nebi Rubin	1304
	<i>Tetrabothrius cylindraceus</i>	Nebi Rubin	1302
<i>Larus ridibundus</i> L., 1766	<i>Choanotaenia porosa</i>	Gue'ah Road	2219
	<i>Dicranotaenia fusa</i> (Krabbe, 1869)	Gue'ah Road	2223
	<i>Tetrabothrius cylindraceus</i>	Akko	1238
<i>Larus</i> sp.	<i>Choanotaenia porosa</i>	† El-Tur	S257
	<i>Dicranotaenia fusa</i>	† El-Tur	S257
<i>Milvus migrans</i> Bodd., 1783	<i>Idiogenes flagellum</i>	† Bir Gafgafa	S443
<i>Oenanthe oenanthe</i> (L., 1758)	<i>Choanotaenia</i> sp.	Umdarage	1143A
<i>Passer domesticus biblicus</i> Har-tert, 1904	<i>Choanotaenia parina</i> (Dujardin, 1845)	Jerusalem	713A
	*** <i>Dicranotaenia</i> sp.	Jerusalem	828
	<i>Passerilepis passeris</i> (Gemlin, 1790)	Jerusalem	828A
	<i>Raillietina (R.) galeritae</i> (Skrjabin, 1914)	Bet-Guvrin, Jerusalem	184
	*** <i>Raillietina (R.)</i> sp.	Jerusalem, Rehovot	C-101
<i>Pelecanus onocrotalus</i> L., 1758	<i>Armadoskrjabinia medici</i> (Stossich, 1890)	Huleh	C-448
<i>Phoenicopterus ruber</i> L., 1758	<i>Sobolevicanthus</i> sp.	Jerusalem Zoo	C-766
<i>Philomachus pugnax</i> L., 1758	<i>Anatinella brachycephala</i> (Creplin, 1829)	Tel-Amal	1032
	** <i>Nadejdolepis charadrii</i> (Yamaguti, 1935)	Kefar Massaryk	488
	<i>Sobolevicanthus</i> sp.	Tel-Amal	1033
	*** <i>Sobolevicanthus</i> sp.	Kefar Rupin 1046	
<i>Phylloscopus trochilus</i> L., 1758	<i>Microsomacanthus</i> sp.	Rehovot	C-102
<i>Podiceps cristatus</i> L., 1758	<i>Aploparaksis</i> sp.	Tel Amal	1026
	<i>Tatria biremis minor</i> Kowalewsky, 1904	Ma'agan Mikha'el	1294
<i>Podiceps ruficollis</i> (Pallas, 1769)	<i>Pseudanomotaenia</i> sp.	Ma'agan Mikha'el	570
<i>Podiceps</i> sp.	<i>Tatria</i> sp.	Hedera	C-69
<i>Pterocles orientalis</i> L., 1758	<i>Raillietina (R.) tunetensis</i>	Be'er Sheva, Mishmar Ha Negev	1130
	** <i>Raillietina (R.) weissii</i>	Be'er Sheva	1150
<i>Recurvirostra avosetta</i> L., 1758	<i>Aploparaksis</i> sp.	Mishmar Ha Negev	
<i>Scolopax rustica</i> L., 1758	<i>Aploparaksis</i> sp.	Be'er Sheva	C-653
<i>Sterna albifrons</i> (Pallas, 1764)	<i>Aploparaksis</i> sp.	Kefar Massaryk	847

TABLE 1 (suite).

HOST	CESTODE	LOCALITY	* HUJP voucher no.
<i>Streptopelia decaocto</i> (Friv., 1834)	** <i>Cotugnia polyacantha</i>	Bet Alfa	904
<i>Streptopelia turtur</i> L., 1758	<i>Cotugnia polyacantha</i>	Jerusalem, P'lugot, Ramot Ha Shavim	324
	<i>Killigrewia delafondi</i>	Bet Alfa, Jerusalem, Ramoth Ha Shavim	127
	<i>Retinometra serrata</i>	Amatzia	2211
	<i>Sobolevicanthus</i> sp.	Emek Ha'Ela	2210
<i>Sturnus vulgaris</i> L., 1758	** <i>Monopylidium iola</i> (Lincicome, 1939)	Jerusalem	C-515
	<i>Variolepis farciminoso</i> (Goeze, 1803)	Haifa	2218
<i>Tringa erythropus</i> (Pallas, 1764)	<i>Kowalewskiella cingulifera</i>	Atlith	2233
<i>Tringa hypoleucos</i> L., 1758	<i>Polycercus lumbrici</i> Villot, 1883, var. <i>pseudoparadoxa</i> Matthevossian, 1963	Kefar Massaryk	456
	<i>Trichocephaloides megaloccephala</i>	Ma'agan Mikha'el	528
<i>Tringa totanus</i> L., 1758	<i>Acoleus vaginatus</i>	Kefar Massaryk	871-A
	*** <i>Cloacotaenia</i> sp.	Kefar Massaryk	870
	<i>Kowalewskiella cingulifera</i>	Bet Alfa, Kefar Massaryk, Ma'agan Mikha'el	516
	<i>Pseudanomotaenia paramicrorhyncha</i> (Dubinina, 1953)	Bet Alfa	998
<i>Turdus merula syriacus</i> (Hempr. et Ehr., 1828)	<i>Dilepis undula</i> (Schrank, 1788)	Ein Hemed, Jerusalem, Petah-Tikva, Zova	2208
	<i>Fernandezia spinosissima</i> (Linstow, 1893)	Jerusalem	2209
	<i>Variolepis farciminoso</i>	Petah-Tikva	2205
<i>Turdus philomelos</i> Brehms, 1835	<i>Raillietina</i> (R.) sp.	Jerusalem	C-371
	** <i>Variolepis farciminoso</i>	Jerusalem	C-370

† A site in the Sinai peninsula.

\* HUJP Hebrew University, Jerusalem, Parasitological Collection.

\*\* New host record.

\*\*\* To be discussed further in a later publication.

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